Pulsatile Flow Module

Use of variable shear within the BioFlux system to simulate vascular conditions

Shear stress in the vasculature plays a major role in maintenance of hemostasis. Within regions of circulatory system, the flow is pulsatile as a function of vessel proximity to the heart as well as the geometry and health of the vessel leading to variable regional shear loading. Numerous types of pulsatile flow have been identified, which are characterized by the propensity to contribute to atherosclerotic plaque formation on the vessel wall.Pulsatile flow generally occurs as a waveform function. At the most basic level it can take the form of a sinusoidal wave (Figure 1) and can become more complex depending on the vascular location.

The Pulsatile Flow Module works with BioFlux Control Software to provide user-defined pulsatile flow profiles. Within the main BioFlux Control Panel, you can select the Pulsatile option and define a shear stress amplitude and frequency. This module is fully compatible with all of the other BioFlux control options. This module is recommended for a wide range of applications, particularly in vascular biology.
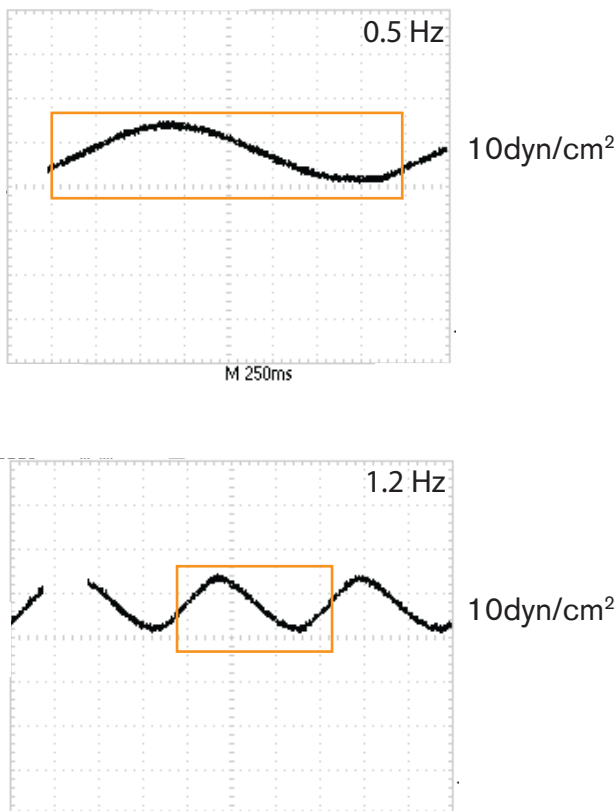
0.5 Hz

$10 dyn/cm^2$

M 250ms

1.2 Hz

$10 dyn/cm^2$

Figure 1: Sample waveforms at a maximum amplitude of 10 dyn/cm^2. Each cycle is shown within the boxed region.
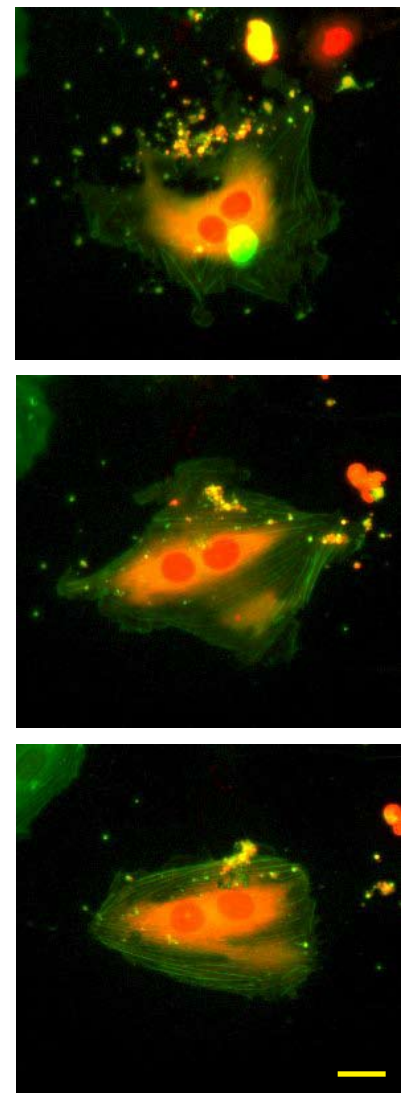

Figure 2: The BioFlux system was used to apply pulsatile shear flow (amplitude 5dyn/cm^2, frequency 1.2 Hz) to endothelial cells transiently expressing actin-GFP constructs (green) and NLS-RFP, nucleus (red). Micrographs were captured every 30 minutes during the application of shear; shown (from top) are 0, 8.5, and 19 hr time points. Scale bar is 25 microns.

Relevant Applications for the Pulsatile Flow Module:

- Endothelial cell biology (Figure 2)
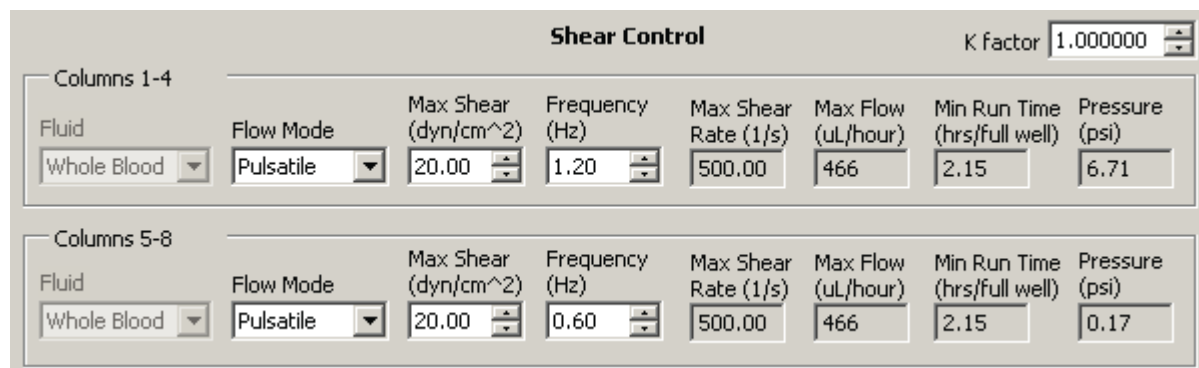- Platelet biology

Figure 3: The Pulsatile Flow Module is embedded in the BioFlux Software control panel. Simply select the Pulsatile flow mode, then enter a shear amplitude and frequency. The module is fully compatible with your existing flow protocols and methods.

Specifications

Pulsatile Flow

Waveform: Sinusoidal waveform

BioFlux Plate Compatibility:
24-well Plate (8 channels)
48-well Plate (24 channels)
48-well High Shear Plate (24 channels)

Shear Stress Amplitude:
0.1 – 20 dyne/cm^2 for 24- and 48-well Plates
0.1 - 200 dyne/cm^2 for 48-well High Shear Plates

Frequency Range: 0-1.2 Hz at 20 dyne/cm^2 (0-72 bpm)

System Requirements

Operating System: Windows XP, Vista or Win 7

Hardware Requirements: BioFlux 200 or1000 System

BioFlux software version: Pulsatile Flow Module is embedded in BioFlux Software Version 2.4.0.0 and later.
An unlock code is required to begin use which is supplied with purchase.

Ordering Information

Fluxion Part Number: 940-0020

FLUXION

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